Device for aiding the orientation of the blind

The invention relates to a device that aids the orientation of the blind, which contains a sensing unit that can be fixed to the body surface of the person using it and a processing unit that is connected to the sensing unit.

There are many types of device today that aid the blind to move about, of these there is the stick, the disadvantage of which is that the sensing distance is small. A significant aiding partner is a trained guide dog, the acquisition and keeping of which is very expensive. The general deficiencies of the known aiding devices are that they do not give information regarding the pictures and the direction of the obstacles, only of their presence.

The software that is available commercially is capable of producing a relationship between pictures and sounds, but it requires a great deal of hardware, so because of its dimensions and high price it will not become a mass produced article. Due to the development of microchips development engineers are provided with microprocessors with a high operating speed and a large memory capacity in a sufficiently small size, cheaply, and they can be programmed as required, so they may become mass produced articles, like for example, the hearing aid.

With the invention our aim was to overcome the deficiencies of the known aiding devices and to create a device that supports the picture creating ability of the blind and so improves their sureness of movement and aids better and more precise orientation.

Our aim was for the device to be small and its production cost and selling price allow it to be sold as a mass produced article.

The basis of the idea of the invention was formed by the recognition that if with the help of an optical device fixed to the head capable of producing pictures of objects, comparing these with the pictures of groups stored earlier in a database with the help of a computing device we select a sound identifier that the most closely relates to the object and this is played to the blind person in an audible form, then carrying out the simple picture-sound transformation the task may become solvable.

In accordance with the set aim the device according to the invention to aid the orientation of the blind – which contains a sensing unit fixed to the body surface of the person using it and processing unit connected to the sensing unit – is formed in such a way that the sensing unit has a CCD camera and the processing unit has a microprocessor, the microprocessor has an analogue input, external bus and output, through the signal forming unit of the camera it is connected to the analogue input of the microprocessor, picture memory and sound memory is connected to the external bus of the microprocessor, and with the implementation of an amplifier a loudspeaker suitable for transmitting speech information is connected to the output of the microprocessor.

A further criterion of the device according to the invention is that the microprocessor has a data transfer input, and through a recording unit temporarily connected to the data transfer input a microphone is connected serving to read in verbal information.

In a possible version of the device the microprocessor has a controller part unit suitable for reading in and processing picture and sound information at the same time, the controller part unit is connected to the internal memory unit serving as a store for the picture information and a second internal memory unit serving as a store for the sound information, the two internal memory units are connected to an identifying unit serving the searching according to picture information and also serving to connect up the picture and sound information.

The device has numerous advantageous features. An important advantage is that in the brain of a person blinded in an accident there is a kind of „picture" of the environment and the world, so it is easier to give back the concrete pictures of the objects in their area of movement, of his/her home and neighbourhood by naming them.

Those born blind participate in different training processes, where with the help of touch, feel and explanation they carry the visible pictures of only a few objects and situations, so for them the advantage of the device is that making use of its free programming ability so-called global pictures can be produced in accordance with the person's „vocabulary".

A favourable point is that due to the transformation of new picture information to sound information recognising, identifying obstacles occurring while moving about as pictures, then playing them as sound, the device guarantees a much better feeling of security than the already realised bleeper, signalling devices.

Another advantage is that on the one hand that the picture and word vocabulary of the device is programmed in a fixed way during manufacture, and on the other hand that a seeing person in the environment of the person using the device can carry out customised programming, so the device can become language independent and be simply used anywhere in the world.

Another favourable feature is that the information stored in the device does not use the „usual: bmp, jpg, ..." picture storage procedures, but its unique resolution is low (64x8 bit is one picture), so due to the small amount of space required the upper limit of the number of pictures that can be stored is only a question of memory capacity, it is possible to produce cheaper, more modest one hundred word devices, or more expensive devices containing even one thousand picture word connections.

Due to the low resolution an advantage is that many different objects, but similar in profile are forced into one group, but the aim is not to recognise a type, or the brand of a motor vehicle, differentiating is satisfactory.

Another advantage that has to be mentioned is that the weight of the device is low, as its consumption, its price is modest, affordable by all, its covering is protected against rain, its sensitivity even in dusk is satisfactory, as it ensures stable operation even in environmental light of 0.2 lux.

It is also important to emphasise the advantageous feature that technically a resolution may be attained with which letters, characters may be „read out", and with this a new area of use opens, not only for the blind, but also for those with poor sight.

It is practical for the device to be fitted to the arms of a spectacles frame (also ensuring its aesthetic production), in accordance with the head movement-seeing psychological effect it is turned in the direction of „viewing" and so the optical sensor of the device fixed in this way sees a real, black and white picture. A microcomputer transforms the produced signal series with AD conversion, stores it, then compares it with the bit pictures of signal forms belonging to an average of one hundred pictures recorded during programming. In accordance with the result of the comparison an expression is selected that was associated with the picture during programming and the name of the picture is read out through miniature loudspeakers.

In connection with the example the invention is presented in more detail on the basis of drawings. On the drawing

Figure 1 is the outline sketch of a version of the device,
Figure 2 is a picture showing the video signal mapping,
Figure 3 is the block diagram of the steps of the operating program.

Figure 1 shows the outline of the important elements of the device. The CCD camera 1 provides the basic signal of the device, which the joining module 2 edits and adjusts in amplitude for the microprocessor 3.

The sample-taking subroutine of the processing program stores the video signal coming into the analogue input 3a of the microprocessor 3 in 64 pieces, 8 bit words – as shown in figure 2 – as one block in the working register. This low resolution gives the device the advantage that it sees quite a lot of similar objects to be the same. The procedure can continue here in two directions.

In the case that we are in the „learning" status, in other words we connect the writing unit 8 temporarily to the data transfer input 3d of the microprocessor 3 then it writes the contents of a given block into the picture memory 4, provides it with a serial number, which it then uses as an index during the search process. At the same time it stores the short describing expression arriving through the microphone 9 into the sound memory 5.

If we are in the recognition or user status, the program – the block outline of which is shown by figure 3 – takes the blocks from the picture memory 4 in line, compares them with the blocks to be found in the working register, then in the case of sameness on the basis of the index belonging to the given block the expression belonging to the index is selected from the sound memory 5, transferred to the output register, then „sent" out through the output to the amplifier 6, then to the loudspeaker 7. The process is repeated like this, then if there is no identifiable block a message „unknown obstacle" is heard.

In the interest of reliable identification the picture needs to be a standing picture for one second!

Deriving from the video signal frequency and the type of microprocessor and its clock pulse (100 MHz) approx. ten measurement take place in one second, this is enough of a guarantee for reliable recognition. This value is close to the human recognising ability, e.g. the running into one another of pictures while you shake your head.

List of references

1 camera
2 joining module
3 microprocessor
3a analogue input
3b external bus
3c output
3d data transfer input
4 picture memory
5 sound memory
6 amplifier
7 loudspeaker
8 writing unit
9 microphone